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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/777,576

02/12/2004

Toshiharu Furukawa

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6152

30206

7590

10/31/2006

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EXAMINER

NADAV, ORI

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 10/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<p align="center">Office Action Summary</p>	Application No. 10/777,576	Applicant(s) FURUKAWA ET AL.	
	Examiner Ori Nadav	Art Unit 2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 April 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-13,15-20 and 34-53 is/are pending in the application.
- 4a) Of the above claim(s) 9-13,20,36,38-42 and 49-51 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-8,15-19,34,35,37,43-48,52 and 53 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 February 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>3/13/06,03/22/06</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

The indicated allowability of claims 14-16 and 18-19 is withdrawn in view of the newly discovered reference(s) to Ochipinti et al. Rejections based on the newly cited reference(s) follow.

Rejoinder of claims 9-13, 20, 36 and 38-42 will be permitted when the independent claims are allowed.

Election/Restrictions

Newly submitted claims 36, 38-42 are dependent on non-elected claims, and newly submitted claims 49-51 are directed to a non-elected invention. Therefore, claims 36, 38-42 and 49-51 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, a device structure 54 comprising a plurality of nanotubes 42, as recited in claim 4, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended

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replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-8, 15-19, 34-35, 37, 43-48 and 52-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Farnworth et al. (6,515,325) in view of Ochipinti et al. (2004/0027889).

Regarding claims 1 and 43, Farnworth et al. teach in figure 1 and related text a circuit comprising:

- an interconnected plurality of semiconductor device structures arranged in an array (see figure 2I), each of said semiconductor device structures further comprising
 - a gate electrode 19 including a vertical sidewall and a gate dielectric disposed on the vertical sidewall,
 - at least one semiconducting carbon nanotube 22 extending substantially vertically between opposite first and second ends at a location adjacent to said vertical sidewall of said gate electrode,
 - a first contact 17 electrically coupled with said first end of said at least one semiconducting carbon nanotube,
 - and a second contact 21 electrically coupled with said second end of said at least one semiconducting carbon nanotube.

Farnworth et al. do not explicitly state that the array is characterized by a plurality of rows and a plurality of columns.

Ochipinti et al. teach that a memory device conventionally uses an array characterized by a plurality of rows and a plurality of columns (paragraph [0010]).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use an array characterized by a plurality of rows and a plurality of columns in Farnworth et al.'s device in order to simplify the processing steps of making the device by using conventional rows and columns array matrix.

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Regarding claims 3-8, 34, 37, 44-48, Famworth et al. teach said at least one semiconducting carbon nanotube is a single-wall semiconducting carbon nanotube, and a plurality of semiconducting carbon nanotubes extending vertically at a plurality of locations adjacent to said vertical sidewall of said gate electrode (see figure 2I), wherein

said first contact includes a catalyst pad (by considering the first contact layer as layer 16, the catalyst pad is layer 16, see figure 2A and related text in column 4, lines 32-50) characterized by nanocrystals of a catalyst material effective for growing said at least one semiconducting carbon nanotube, wherein

said first end of said at least one semiconducting carbon nanotube incorporates an electrical-conductivity enhancing substance diffused from said catalyst pad into said first end during growth, and

an insulating layer disposed between said first contact 17 and said gate electrode 19 for electrically isolating said first contact from said gate electrode, and

an insulating layer disposed between said second contact 21 and said gate electrode for electrically isolating said second contact from said gate electrode.

Regarding the process limitations recited in claims 5-6 ("nanocrystals of a catalyst material effective for growing said at least one semiconducting carbon nanotube", and "an electrical-conductivity enhancing substance diffused from said catalyst pad into said first end during growth"), these would not carry patentable weight in this claim drawn to a structure, because distinct structure is not necessarily produced.

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Note that a "product by process" claim is directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See also *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wertheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and *In re Marosi et al.*, 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that the applicant has the burden of proof in such cases, as the above case law makes clear.

Regarding claims 15-18, prior art teach a memory circuit comprising:

a plurality of word lines each electrically interconnecting said gate electrode of each of said plurality of semiconductor device structures located in a corresponding one of said plurality of rows of said array; and

a plurality of bit lines each electrically interconnecting said second contact of each of said plurality of semiconductor device structures located in a corresponding one of said plurality of columns of said array, wherein
each of said plurality of word lines comprises said gate electrode of each of said plurality of semiconductor device structures located in said corresponding one of said plurality of rows of said array, wherein

each of said plurality of bit lines comprises a conductive stripe electrically coupling said source of each of said plurality of semiconductor device structures located in a corresponding one of said plurality of rows of said array.

Regarding claims 19 and 52, prior art teach a substrate carrying said plurality of semiconductor device structures and characterized by a surface area viewed vertical to the substrate, said plurality of semiconductor device structures separated a space filled by a dielectric material. Prior art do not teach said space ranging from about 20 percent to about 50 percent of said surface area. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a space ranging from about 20 percent to about 50 percent of said surface area in prior art's device in order to reduce the size of the device and by optimizing the characteristics of the device.

Regarding claims 35 and 53, prior art teach a capacitor electrically coupled with said first contact.

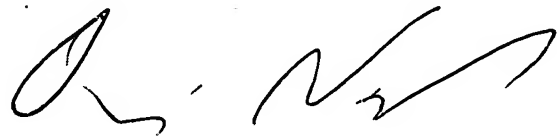
Response to Arguments

Applicant's arguments with respect to claims 1, 3-8, 15-19, 34-35, 37, 4-48 and 52-53 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ori Nadav whose telephone number is 571-272-1660. The examiner can normally be reached between the hours of 7 AM to 4 PM (Eastern Standard Time) Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Elms can be reached on 571-272-1869. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



O.N.
10/27/06

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